



Clean Energy Overview: Montana & Western Markets

December 8, 2017

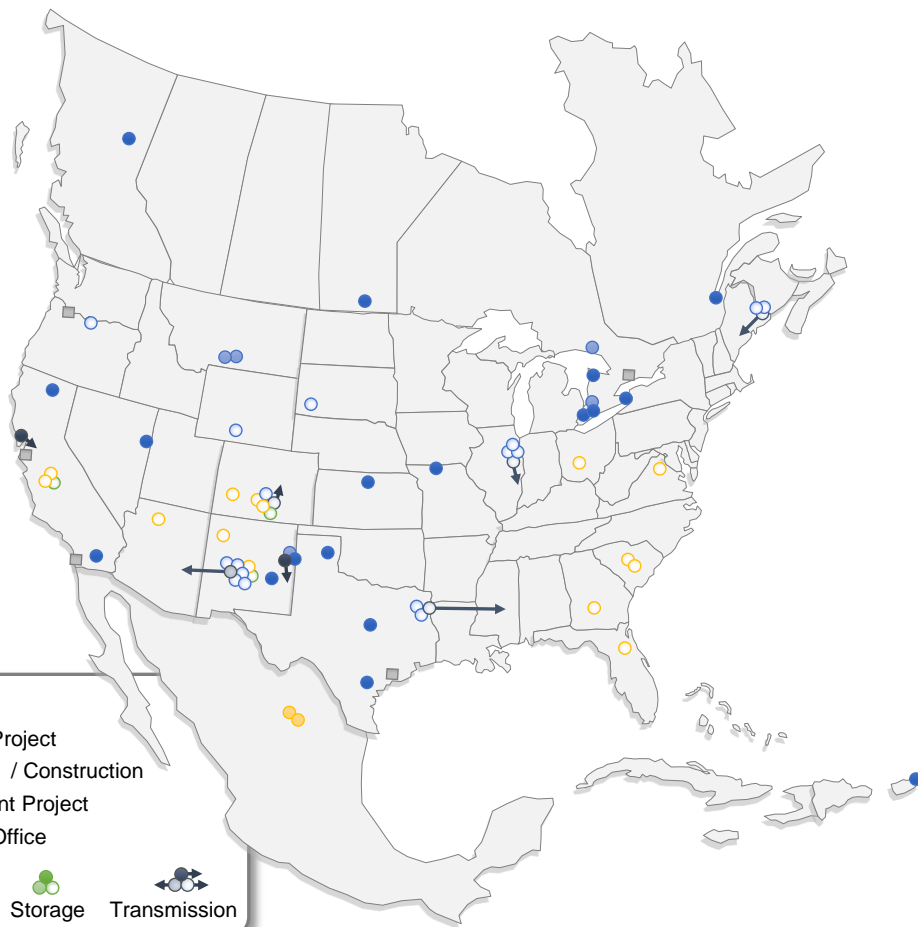
Johnny Casana

Pattern Energy, Western Region Government Relations
American Wind Energy Association, Western State Policy Chair

Overview

- About Pattern Energy
- Industry Progress
- Montana Wind: Opportunities & Challenges

About Pattern Energy



Legend

- In-Service Project
- Late -Stage / Construction
- Development Project
- Corporate Office

Wind Solar Storage Transmission

About Us

- ❖ **North America's #1 Independent Renewable Company** (non-utility-owned)
- ❖ **Diverse Energy Portfolio:** wind, solar, storage, transmission
- ❖ **4,600+ MW** operational assets across five countries
- ❖ **\$12+ Billion** private capital financed and deployed
- ❖ **10,000+ MW** of development projects in pipeline
- ❖ **Long Term Business Plan:** Pattern Energy & its affiliates develop, construct, own, & operate



Legend

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Wind



Solar



Storage



Transmission

❖ Late-Stage Wind Projects:

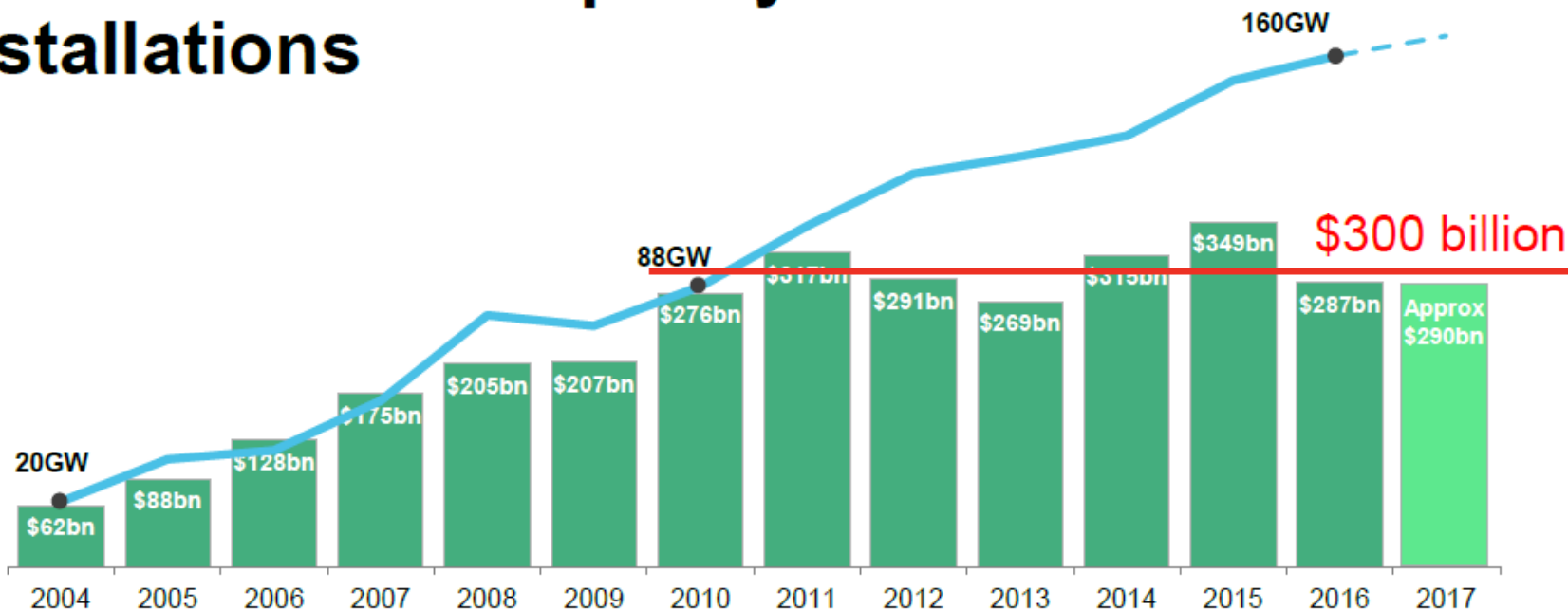
- 2018: Stillwater, 80 MW
- 2019: Crazy Mountain, 80 MW
- 2020: ???

❖ Stillwater & Crazy Mountain Economic Benefits:

- \$36 Million in local tax revenue
- 250+ construction jobs (2 years)
- 14 operations jobs (20-30 years)
- Community benefits programs
- 2nd highest tax payer in Sweet Grass County

Industry Progress

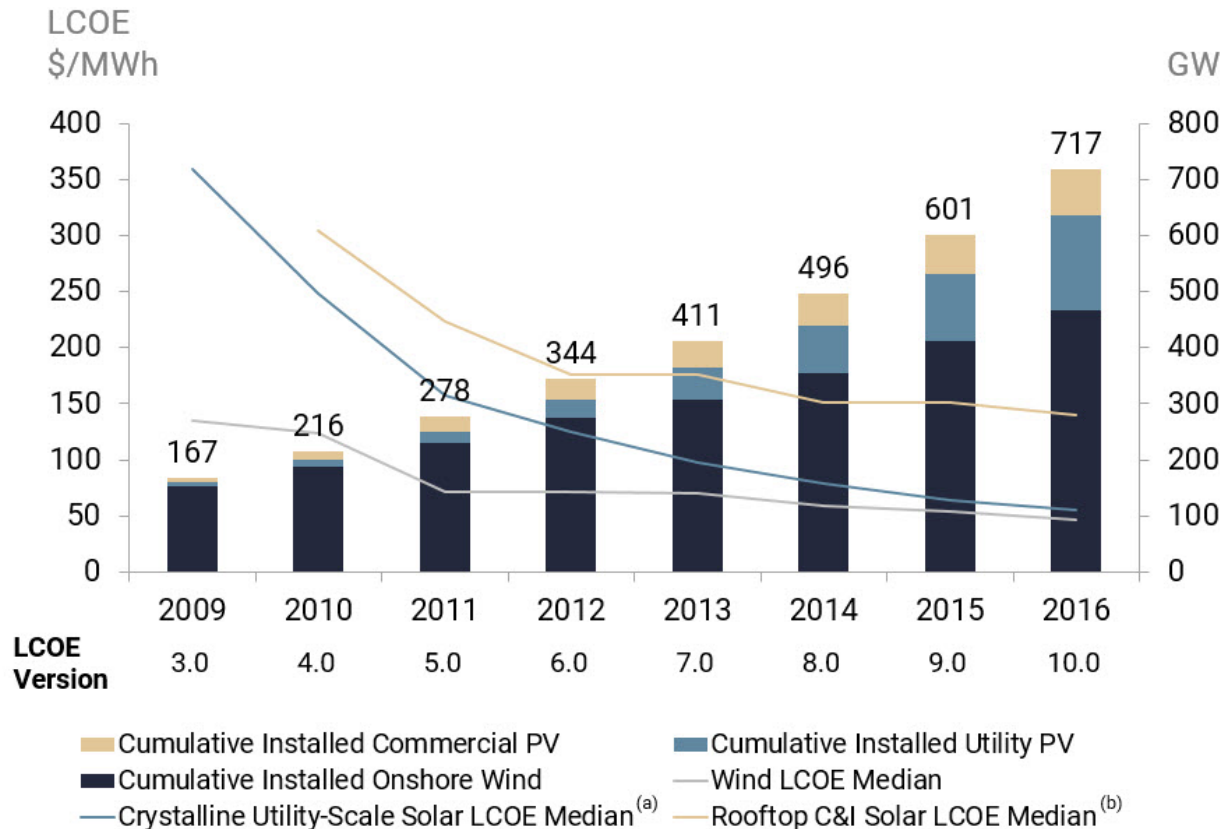
Global new clean energy investment and capacity installations



Total values include estimates for undisclosed deals. Includes corporate and government R&D, and spending for digital energy and energy storage projects (not reported in quarterly statistics). Excludes large hydro.

Wind & Solar Price Decline

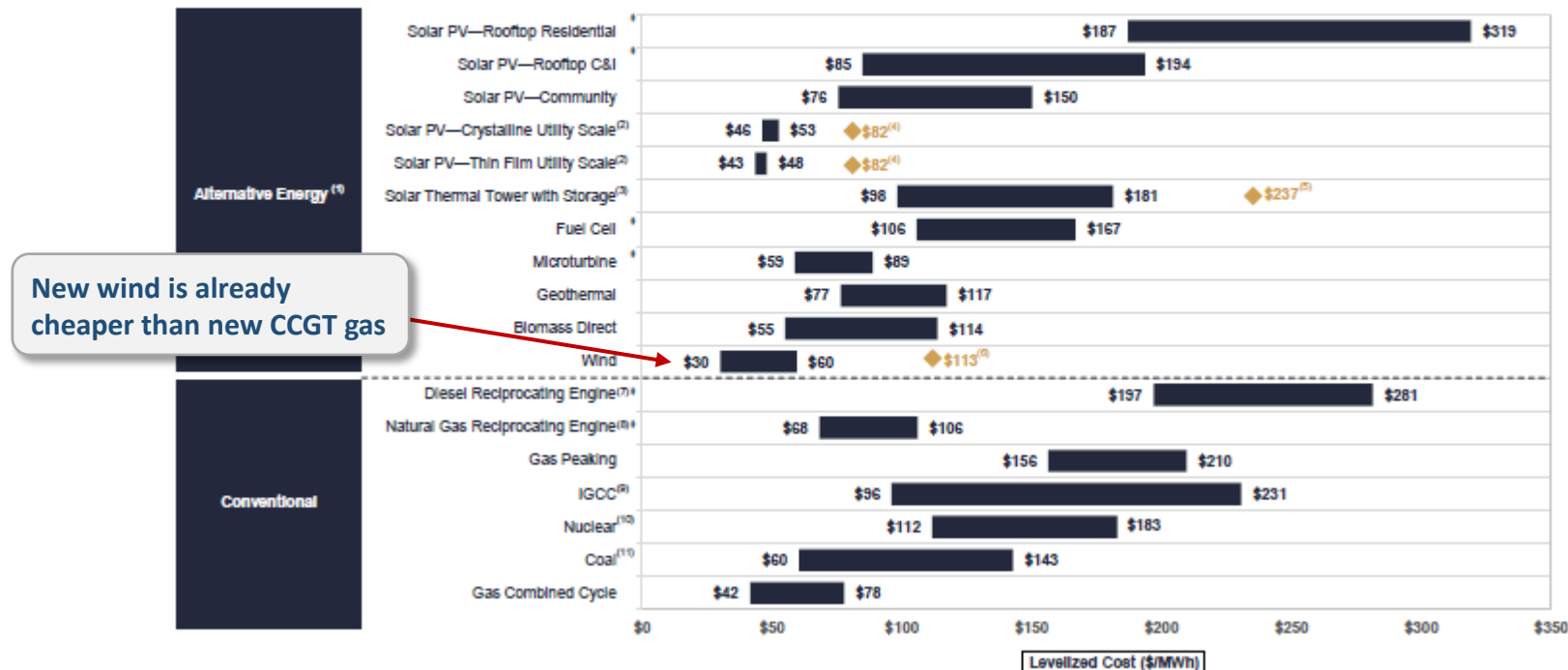
Unsubsidized Levelized Cost of Energy—Wind/Solar PV (Historical)



Wind & Solar Price Decline

Unsubsidized Levelized Cost of Energy Comparison

Certain Alternative Energy generation technologies are cost-competitive with conventional generation technologies under some scenarios; such observation does not take into account potential social and environmental externalities (e.g., social costs of distributed generation, environmental consequences of certain conventional generation technologies, etc.), reliability or intermittency-related considerations (e.g., transmission and back-up generation costs associated with certain Alternative Energy technologies)

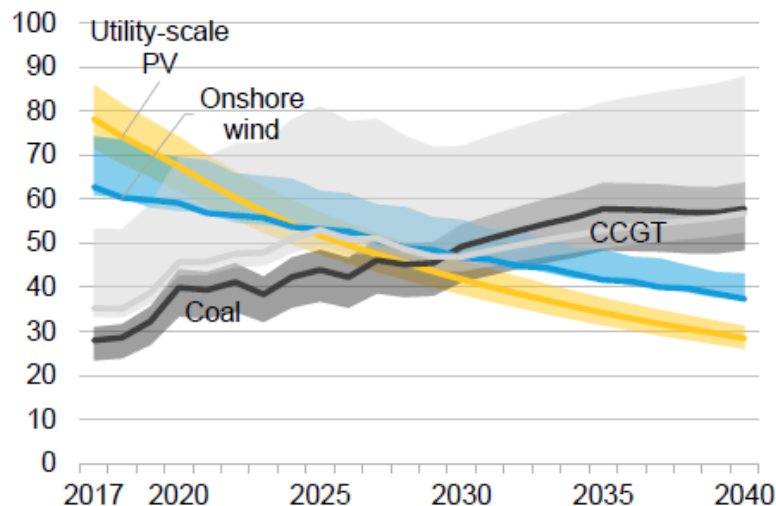


Wind & Solar vs. Existing Fossil-Combustion

Within 20 years it will be cheaper to build new wind & solar than to maintain existing fossil-combustion plants. (BNEF, 2017)

Germany

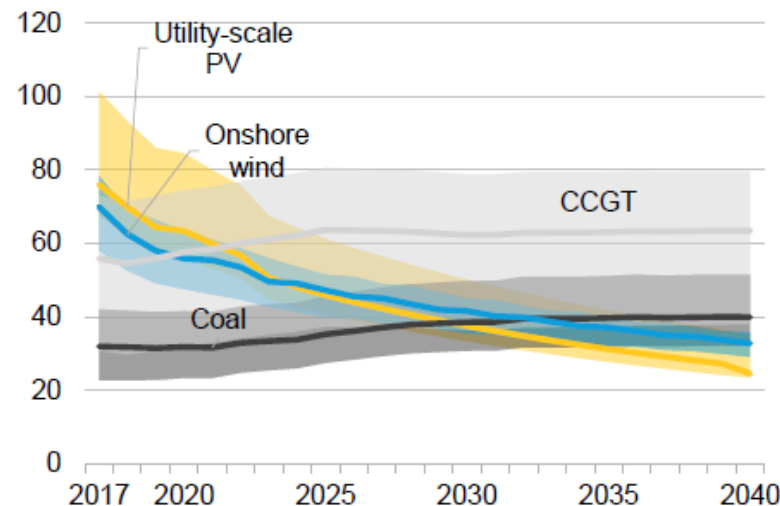
\$/MWh (real 2016)



Source: Bloomberg New Energy Finance, NEO 2017

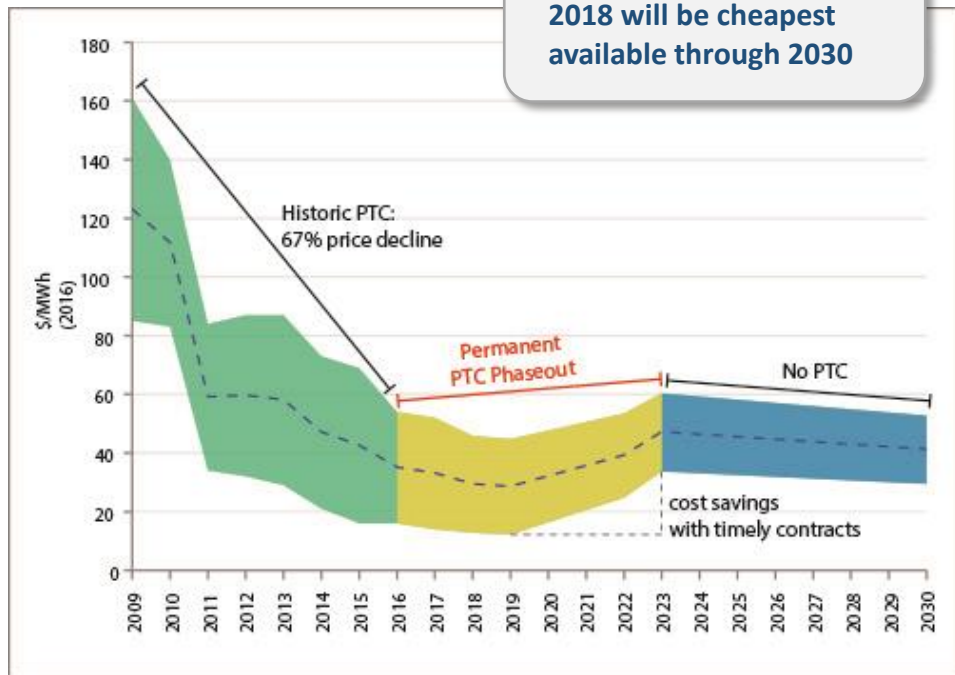
China

\$/MWh (real 2016)



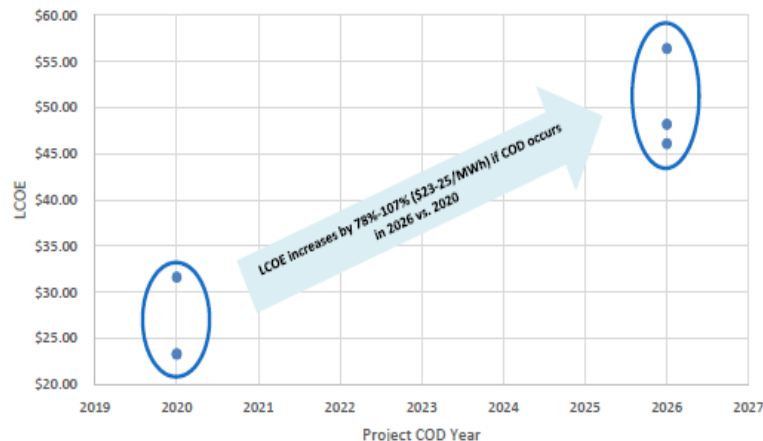
Near Term Wind Opportunity: PTC Phase-Out

Wind contracts signed in 2018 will be cheapest available through 2030



Sources: LAZARD 2017; BNEF 2017; NREL 2016; LBL/IEA 2017; EIA 2017

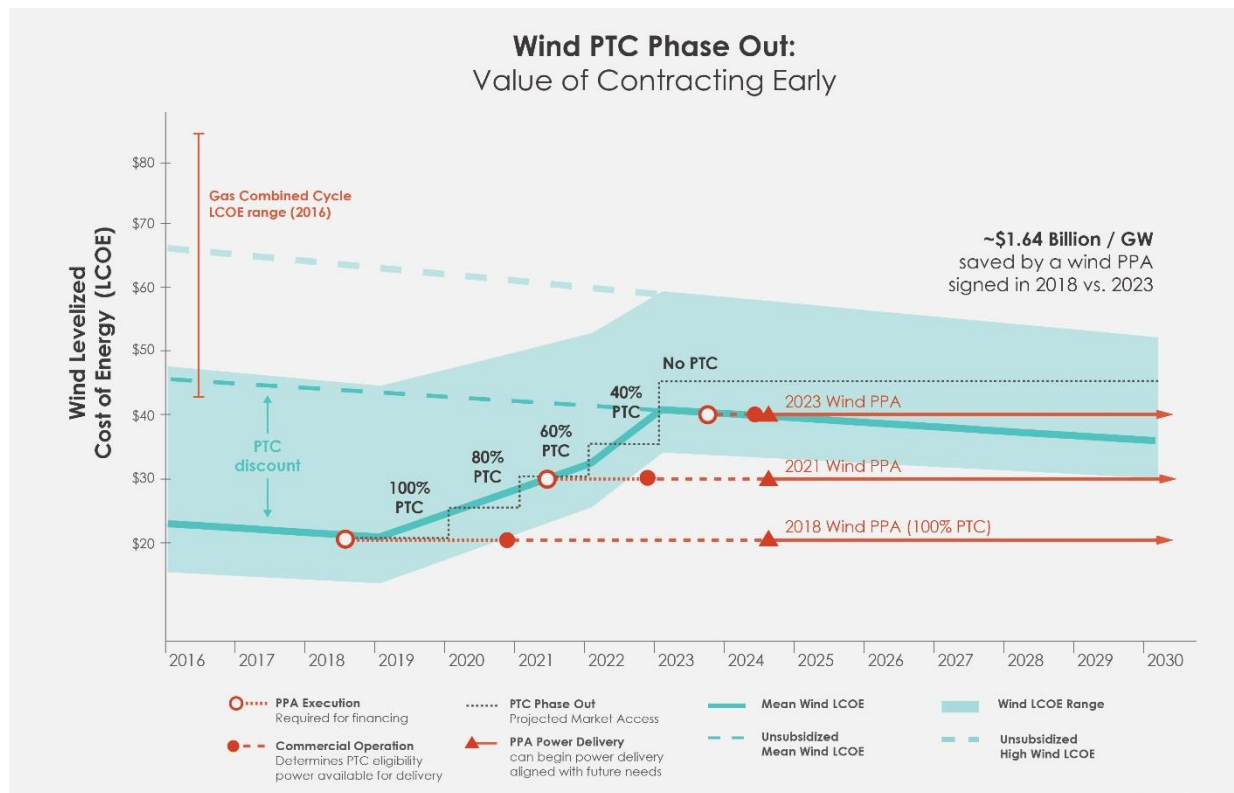
FIGURE 2: LEVELIZED COST OF ENERGY BY COD FOR ALL SCENARIOS (2016 \$/MWH)



Source: Energy Strategies, 2017

Energy Strategies estimates ~\$1.9 Billion/GW in ratepayer savings for 2018 contracts vs. 2023

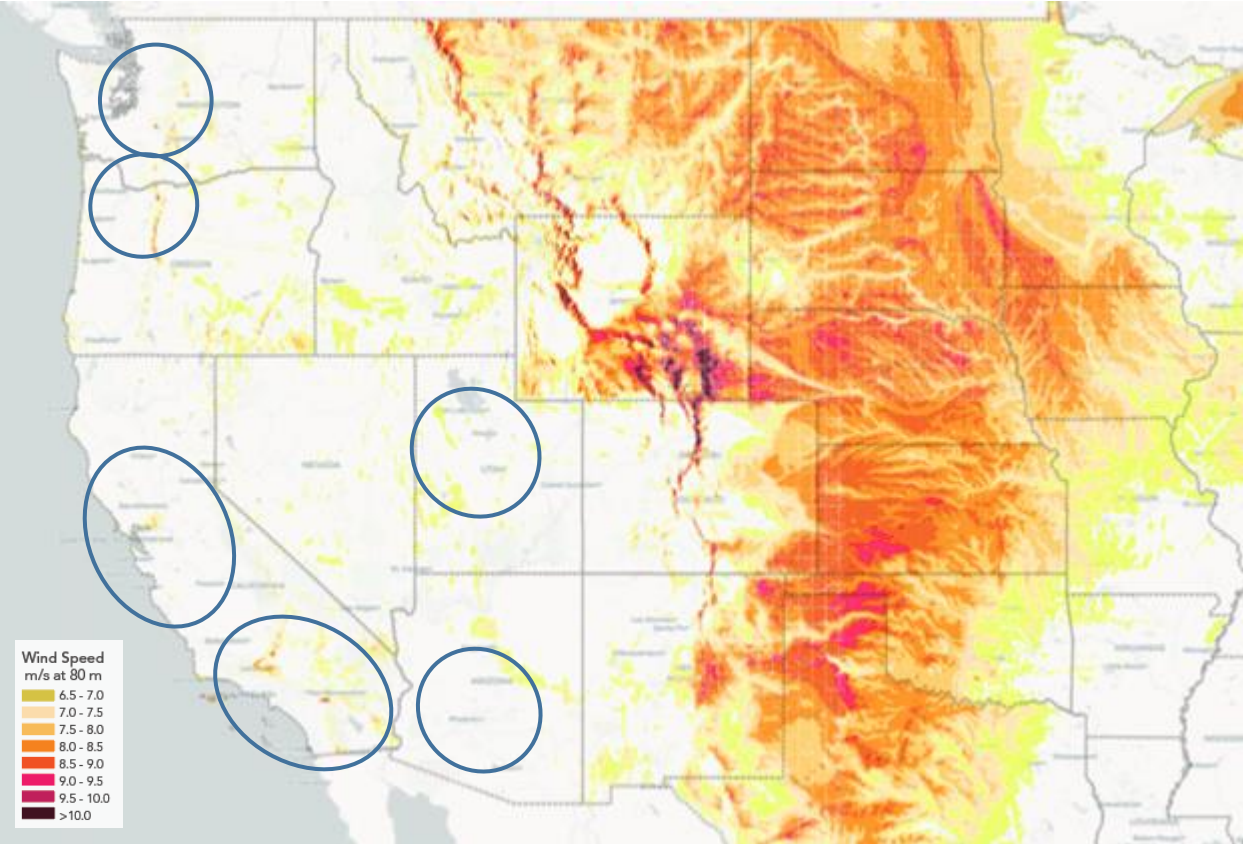
Near Term Wind Opportunity: PTC Phase-Out



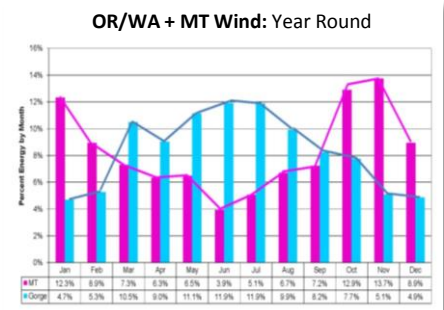
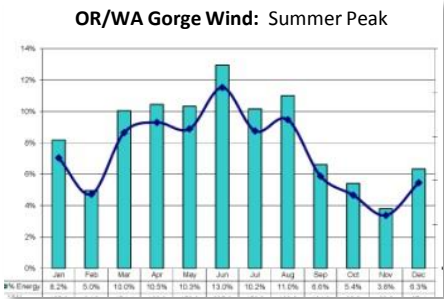
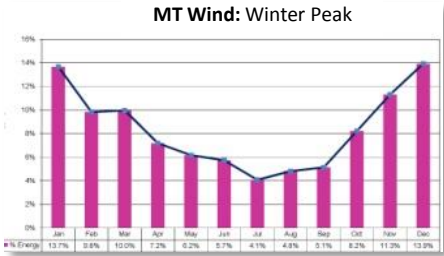
- 1) LCOE adapted from "IAZARD's Levelized Cost of Energy Analysis 10.0", IAZARD (2016), and "Forecasting Wind Energy Costs & Cost Drivers", NREL, Lawrence Berkeley Lab, IFA Wind (2016). Natural Gas Combined Cycle LCOE includes forward curve projections on the cost of fuel.
- 2) The PTC will phase out entirely by 2024, and full value 100% PTC wind projects are projected to be available for contract with load serving entities before 2019, as per "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2017", EIA (2017)
- 3) PTC savings: 100% PTC @ \$23/MWh x 1,000 MW x 20 yr PPA x 8,760 hr/yr x 48% NCF x - 9% in NREL assumed cost reductions = ~\$1.62 Billion in nominal ratepayer savings.
- 4) PPAs for PTC projects will need to be executed by 2018 in order to account for construction time lines necessary to achieve commercial operations by 2020.
If necessary, power contracts can be designed to defer power delivery until it is required by a utility, even if that need will arise after 2020.
- 5) PTC = Production Tax Credit; PPA = Power Purchase Agreement; LCOE = Levelized Cost of Energy

Montana Wind Opportunities & Challenges

Montana Wind Matters to the West



The wind power resource data for this map was produced by TrueWind Solutions using the Mesomap system and historical weather data. It has been validated with available surface data by the National Renewable Energy Laboratory and wind energy meteorological consultants.



Successful Project Checklist

- ☒ Wind resource
- ☒ Willing land owner
- ☒ Responsible permit path
- ☒ Market appetite
- ☐ Transmission